We claim:

1. A fuel cell comprising an anode, a cathode and an electrolyte in contact with said anode and said cathode, wherein said anode comprises an anode material having a plurality of molecular recognition sites.

2. A fuel cell as claimed in claim 1, wherein said anode material comprises a supramolecule, which is selected from the group consisting of:

a plurality of chains, wherein each said chain includes a plurality of molecular recognition sites,

a plurality of layers, wherein each said layer includes a plurality of molecular recognition sites,

and a three dimensional open-frame structure, which includes a plurality of molecular recognition sites.

3. A fuel cell as claimed in claim 2, wherein said supramolecule comprises a material selected from the group consisting of an octahedral-tetrahedral framework, a pyramidal-tetrahedral framework and a tetrahedral-tetrahedral framework.

4. A fuel cell as claimed in claim 1, wherein said anode material is an inorganic material.

5. A fuel cell as claimed in claim 1, wherein the molecular recognition sites recognize a fuel selected from the group consisting of fructose, galactose, glucose, lactose, mannose, sucrose, methanol, ethanol, propanol, butanol, tert-butanol and mixtures thereof.

6. A fuel cell as claimed in claim 1, wherein said anode material comprises:

a material selected from the group consisting of titanium, vanadium, chromium, manganese, iron, cobalt, nickel, copper, zinc, gallium, germanium, niobium, molybdenum, indium, tantalum, tungsten, compounds containing one or more of these metals and mixtures thereof; and

a complexing agent, which is selected from the group consisting of arsenic acid, boric

acid, germanic acid, oxalic acid, phosphoric acid, silicic acid, calcium arsenate, potassium arsenate, sodium arsenate, sodium bromate, ammonium germanate, magnesium germanate, ammonium hexafluorogermanate, germanium oxide, ammonium phosphate, calcium phosphate, magnesium phosphate, potassium phosphate, sodium phosphate, sodium silicate, sodium tetraborate, sodium vanadate dihydrate, and mixtures thereof.

7. A process to prepare an anode material for a fuel cell comprising the steps of:

mixing a fuel, a complexing agent dissolved in a suitable solvent, and a material selected from the group consisting of metals, metal compounds and mixtures thereof to form a mixture;

heating said mixture to a suitable reaction temperature and for a suitable reaction time to form a metal complex in said mixtures;

cooling said mixture to form crystals in said mixture; and

separating said crystals from said mixture.

8. A process as claimed in claim 7, wherein said complexing agent is selected from the group consisting of arsenic acid, boric acid, germanic acid, oxalic acid, phosphoric acid, silicic acid, calcium arsenate, potassium arsenate, sodium arsenate, sodium bromate, ammonium germanate, magnesium germanate, ammonium hexafluorogermanate, germanium oxide, ammonium phosphate, calcium phosphate, magnesium phosphate, potassium phosphate, sodium phosphate, sodium silicate, sodium tetraborate, sodium vanadate dihydrate, and mixtures thereof.

9. A process as claimed in claim 7, wherein said complexing agent is selected from the group consisting of arsenic acid, oxalic acid, phosphoric acid, germanium oxide, potassium phosphate, sodium phosphate and sodium vanadate dihydrate.

10. A process as claimed in claim 7, wherein said solvent is selected from the group consisting of water, methanol, ethanol, propanol, butanol, azeotropes thereof and mixtures thereof.

11. A process as claimed in claim 7, wherein said metals are selected from the group consisting of titanium, vanadium, chromium, manganese, iron, cobalt, nickel, copper, zinc, gallium, germanium, niobium, molybdenum, indium, tantalum, tungsten, and said metal compounds contains at least one of these metals.

12. A process as claimed in claim 7, wherein said fuel is selected from the group consisting of fructose, galactose, glucose, lactose, mannose, sucrose, methanol, ethanol, propanol, butanol, tert-butanol and mixtures thereof.

13. A process as claimed in claim 12, wherein said fuel is glucose.

14. A process as claimed in claim 7, further comprising the step of:

activating said crystals by oxidation of said fuel in said crystals using a process selected from the group consisting of an electrochemical process, a thermal process and a mechanical process.

15. A process as claimed in claim 7, wherein said suitable reaction temperature is between 0°C and 400°C.

16. A process as claimed in claim 7, wherein said suitable reaction time is between 1 hour and ten days.

17. An anode material for a fuel cell made using a process as claimed in claim 7.

18. An anode material for a fuel cell made using a process as claimed in claim 13.

19. A method to generate electricity comprising the steps of:

contacting a fuel with an anode which comprises sites which can interact with said fuel via molecular recognition sites on said anode;

contacting an oxidizing agent with a cathode which is in electrical contact with said

anode via an electrolyte to generate an electric current.

20. A method as claimed in claim 19 further comprising the step of:
regenerating said molecular recognition sites on said anode.

21. A method to generate electricity claimed as in claim 19, wherein said fuel is glucose.

22. A method to generate electricity claimed as in claim 19, wherein said oxidizing agent is selected from the group consisting of air, oxygen and mixtures thereof.